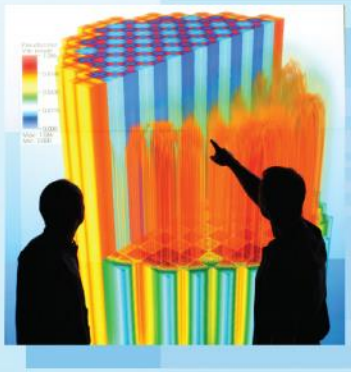
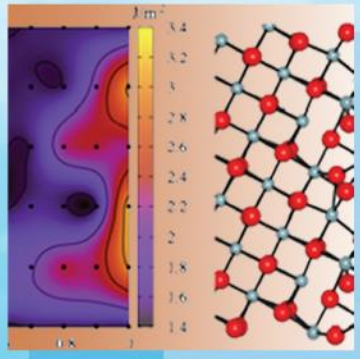
Power uprates
and plant life extension



Engineering design
and analysis

Science-enabling
high performance
computing



Fundamental science

Plant operational data

CASL-U-2013-0146-000

Consortium for Advanced Simulation of LWRs

VERA Release Plan
Revision 1

Stephen M. Hess, EPRI
Rose Montgomery, TVA

AMA Focus Area

26 April 2013

U.S. DEPARTMENT OF ENERGY | Nuclear Energy

REVISION LOG

Revision	Date	Affected Pages	Revision Description
0	1/31/2013	N/A	Original Version
1	3/30/2013	4 / 5 – 7 / 12 / 13 – 17 / 19	Revision to incorporate VERA Aciton Matrix for initial Test Stand release (June) and Alpha release (September) in 2013.

Document pages that are:

Export Controlled _____

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Requested Distribution:

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Paul Turinsky, CASL Chief Scientist

Copy: Jeff Banta, CASL Program Manager
Matt Sieger, CASL Quality Manager
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Chris Stanek, CASL MPO Focus Area Lead
William Martin, CASL RTM Focus Area Lead
Mark Christon, CASL THM Focus Area Lead
John Turner, CASL VRI Focus Area Lead
James Stewart, CASL VUQ Focus Area Lead
Zeses Karoutas, CASL Challenge Problem Integrator
Rose Montgomery, CASL Applications Integrator

CONTENTS

CASL VERA Release Plan

Revision 1

1. PURPOSE AND SCOPE

The primary objective of this document is to provide guidance associated with the key elements of an initial VERA release plan, including targeted code capabilities, product documentation, user support and intellectual property management that are required to support successful deployments of the VERA software during 2013. These initial trial deployments in 2013 are intended to develop and demonstrate the capabilities of the CASL team to successfully execute later public deployments of VERA. It is intended that this document will serve as the starting point for development of a comprehensive VERA release plan to support the initial public deployment at the end of fiscal year (FY) 2014.

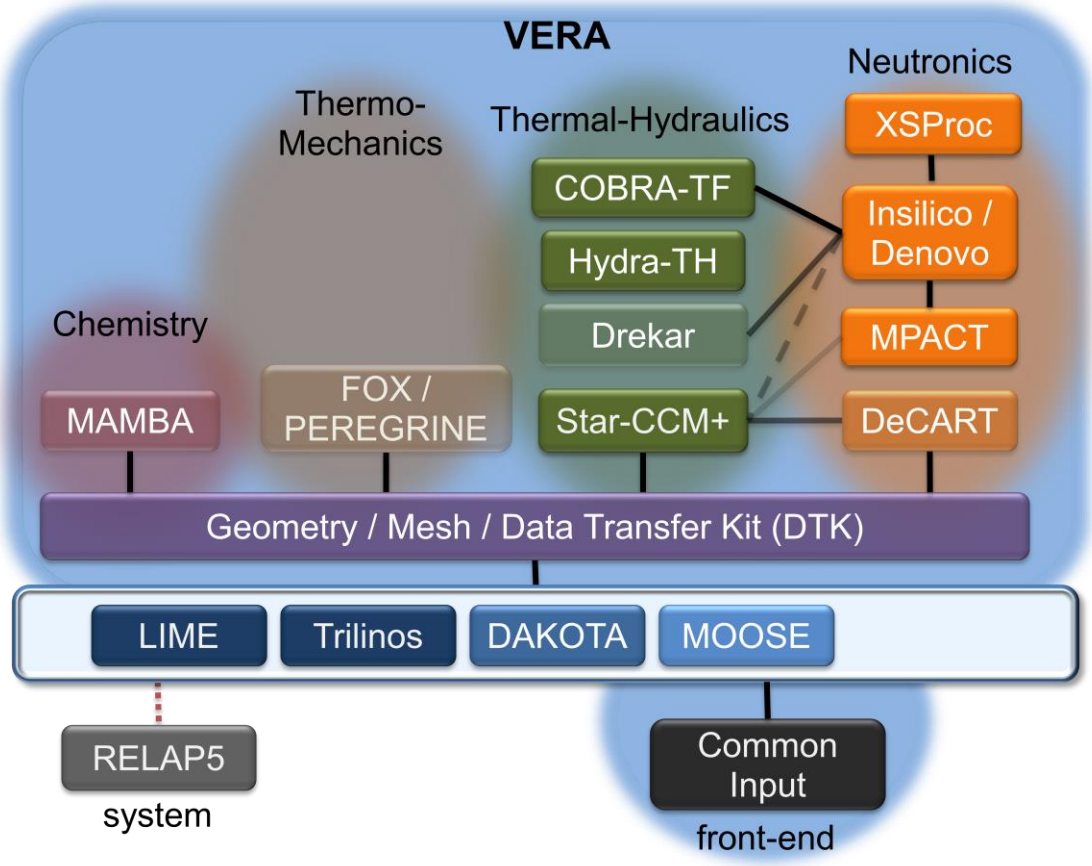
This plan addresses the following two deployments only:

(1) Deployment for use to support CASL Test Stand applications (anticipated June 2013).

(2) Alpha version deployment at the end of FY-2013 (September 2013).

Section 2 of this release plan provides a listing of technical capabilities (Sections 2.1 and 2.2) and associated documentation (Sections 2.3 and 2.4) that will be needed to permit users of VERA to install and utilize the software within a controlled demonstration environment (e.g. Test Stands or other early adopter applications). The capabilities that were integrated into VERA during VERA Snapshot 3.0 in FY-2013 are shown schematically in Figure 1 below.

Next Development Snapshot: VERA 3.0 (03/2013)



FY-2013 Targeted VERA Capabilities (Snapshot 3.0)

A critical element of the successful deployment of VERA is the capability to provide necessary user support for the software. This release plan further identifies critical areas of user support that must be provided by CASL as part of the deployments described in this release plan. However, due to the early and limited nature of these deployments, the current management and organizational structure and functions will be relied upon to provide this user support as described in Section 2.6 of this release plan. Future release plans that address more broadly available VERA deployments (e.g.. public releases of VERA) should specify additional requirements to address necessary user support activities.

A key element of VERA external deployments is ensuring the background intellectual property (BIP) provided by the various CASL partners are adequately protected. An additional issue associated with these deployments will be to ensure that appropriate export control (EC) reviews and protocols are put into place. Items associated with these reviews and approvals by the CASL partners and Senior Leadership Team (SLT) are addressed in Section 3 of this release plan.

Note that the targeted capabilities enumerated in this release plan have been based on the approved CASL program plan and Plan of Record (PoR) milestones and thus reflect the planned and committed CASL workscope through the completion of PoR-6 (end of March 2013) and PoR-7 (end of Septemebr 2013). These capabilities also reflect expectations for the underlying codes and

couplings that will be contained in the identified VERA deployments. Finally, it is the responsibility of the CASL SLT and FA Leads to ensure successful integration of these capabilities to achieve the targeted level of functionality for each VERA deployment that is described in this release plan.

2. VERA RELEASE PLAN

This release plan was developed from and is compatible with the VERA Requirements Document (VRD) and associated Core Simulator (VERA-CS) progression problems. This release plan also is based on and is compatible with the published VRI VERA development plan (as described by the VRI POR-6 / POR-7 roadmap). Corresponding requirements[a] associated with these capabilities are specified in Section 3 (general capabilities) and Section 4 (challenge problem capabilities) of the VRD [Reference 1] and the specific foundational capabilities specified in Reference 1 Appendix A. Finally, given the development foci of CASL during its first two years, it is expected, as a minimum, that the subject releases will support coupled simulations related to the CRUD CASL Challenge Problems. Capabilities may also be available to perform simulations related to other Challenge Problems or supporting other reactor analysis.

To facilitate successful VERA deployments, Section 3 of this report (VERA Release Review and Approvals) contains action matricies that identify specific activites (with applicable references to approved CASL milestones and their associated work tickets in TRAC) that support the scheduled Test Stand and Alpha deployments in FY-2013. The intent of these matricies is to provide an effective mechanism for communication between the various responsible CASL Focus Areas and the Senior Leadership team in the prioritization and management of CASL activities necessary to support successful VERA deployments.

In the case of Test Stand deployments (Section 3.1), the Test Stand host will select (with CASL) a simulation topic that is the primary objective for the Test Stand and exercises particular capabilities of VERA. Thus, the Test Stand may exercise only a few VERA applications, and the action matrix can be structured to address only the subset of capabilities and CASL activities that are necessary to ensure successful deployment of that subset (although that approach is discouraged). The initial Test Stand deployment addressed by this document represents the first in a series of Test Stand deployments of VERA; Appendix A provides a general process that could be used during future CASL planning to identify the necessary subset of capabilities for a similar limited-scope action matrix specific to those Test Stand deployments. It should be noted that Test Stand VERA deployments are intended to be updated frequently as new capabilities and improvements become available using a "pipeline" update process. The envisioned lifetime of a Test Stand is ~6 months.

In contrast, the Alpha release is general in nature and the action matrix associated with it (Section 3.2) always includes the full scope of capabilities that are intended to be included in the alpha deployment.

To support effective resource management, the action matrices provide AMA's recommended prioritization for each capability / activity based on AMA's needs, perceived benefits to CASL, and an assessment of industry stakeholder desires. The prioritization provided is based on a simple 3 level scheme as follows:

- High = Considered to be a capability that is essential for planned near term[b] exercise of VERA. ("Must Have");

[a] Note that specific references to the corresponding requirements specified in the VRD are provided for reference as applicable.

[b] For purposes of this document, near term is defined as a 3-month time span.

- Med = Considered to be a capability that is highly desired for planned near term exercise of VERA. ("Want to Have");
- Low = Considered to be a capability that is ancillary in that it is not planned for use in near term exercise of VERA. ("Nice to Have").

2.1 VERA Technical Capabilities – Test Stand Release

This section addresses VERA technical capabilities that are for the initial CASL Test Stand application (June 2013). This test stand release is anticipated to be used by Westinghouse for core physics analyses associated with the AP-1000 reactor, with a simulation progression of Hot Zero Power (HZP), Hot Full Power (HFP) and HFP with depletion. It is notable that the AP-1000 reactor includes some materials (Tungsten) and some geometric options (14-ft active core, baffle/reflector configurations, IFBA) that may not be fully supported by the existing VERA development and testing plans, and this will be addressed outside of this release plan.

Thus, for the initial VERA depolyment for the Westinghouse Test Stand, the required capabilities are those that apply to provide core simulator capabilities through Core Simulator Progression Problem 5 to facilitate the HZP case. "Pipeline" updates of VERA are expected to provide capabilities for the HFP and HFP/depletion cases at later dates. Note that in the associated action matrix provided in Section 3.1, only activities accociated with the Problem 5 HFP capabilities are included in the matrix and do not encompass other capabilities that are scheduled to be available at the time the Test Stand is deployed.

The release of the VERA software planned for use in initial Test Stand applications is required to provide the following analytical capabilities:

- Core neutronics capability to model the following PWR conditions:
  - Core neutronics capability to model a PWR Hot Zero Power (HZP) Beginning of Life (BOL) Core as described in VERA-CS Progression Problem 5 via 2-D/1-D core neutronics (MPACT). For the Test Stand release of VERA this capability will be demonstrated by successful completion of the following milestones: (1) RTM Level 2 Milestone L2.RTM.P6.01 (Application of 2D/1D MOC to AMA Benchmark Problem No. 5), (2) AMA Level 2 Milestone L2.AMA.P7.01 (Virtual Reactor Demonstration with VERA-CS At BOC, HZP Conditions) and (3) CASL Level 1 Milestone L1.CASL.P7.01 (Operational Reactor Model Demonstration with VERA-CS (CASL.003)) . (Ref: VRD Appendix A Section 2.1)
  - Core neutronics capability to model 2-D PWR Lattice Physics Calculations as described in VERA-CS Progression Problem 2 via MPACT Method of Characteristics (MOC) neutronics. This capability has been demonstrated by the successful completion of AMA Level 3 Milestone L3.AMA.VDT.P6.01 (Analysis of Two-Dimensional Lattice Physics Verification Problems with MPACT). (Ref: VRD Appendix A Section 2.1)
- Subchannel thermal-hydraulics (T-H) capabilities via integration of the COBRA-TF thermal-hydraulic (T-H) code into VERA. For the Test Stand release of VERA this

capability will be demonstrated by successful completion of VRI Level 2 Milestone VRI.P6.04 (VERA 3.0 Snapshot). (Ref: VRD Appendix A Section 2.2)

- Computational Fluid Dynamics (CFD) / T-H capabilities via integration of the HYDRA-TH code into VERA. For the Test Stand release of VERA this capability will be demonstrated by successful completion of VRI Level 2 Milestone VRI.P6.04 (VERA 3.0 Snapshot). (Ref: VRD Appendix A Section 2.2)

- Fuel performance analysis capability (Peregrine). For the Test Stand release of VERA in FY-2013 this capability will be demonstrated by successful completion of VRI Level 2 Milestone VRI.P6.04 (VERA 3.0 Snapshot). (Ref: VRD Appendix A Section 2.3)

- Coolant chemistry analysis capability via integration of the MAMBA code. For the Test Stand release of VERA in FY-2013 this capability will be demonstrated by successful completion of VRI Level 2 Milestone VRI.P6.04 (VERA 3.0 Snapshot). (VRD Appendix A Section 2.3)

For the release of VERA for use in CASL Test Stand applications, integrated summary documentation of the aforementioned capabilities and benchmark results will be developed to provide VERA users with an integrated overview of the state of VERA capabilities. Included in this documentation will be a set of test problems with sufficient data and results to permit the user to set-up and run these problems and verify correct results were generated for both stand-alone and coupled capabilities.

2.2 VERA Technical Capabilities – Alpha Release

In addition to the capabilities required for the initial Test Stand application (Section 2.1), this section addresses VERA technical capabilities that are targets to be contained in the Alpha deployment of VERA scheduled for 30 September 2013 (i.e. end of federal fiscal year 2013 (FY-2013)):

- Core neutronics capability to model the following PWR conditions:

  – Core neutronics capability to model a PWR Hot Full Power (HFP) BOL Assembly as described in VERA-CS Progression Problem 6 via Insilico/Denovo. For the Alpha release of VERA this capability will be demonstrated by successful completion of AMA Level 3 Milestone L3.AMA.VDT.P6.03 (Coupled Single Assembly Solution with VERA-CS). (Ref: VRD Appendix A Section 2.1)

  – Core Simulator capability to model a PWR Hot Full Power (HFP) Beginning of Life (BOL) Core as described in VERA-CS Progression Problem 7 via integration of the MPACT code. This also will demonstrate the capabilities of the VERA-CS to obtain relevant core physics data from relevant models / libraries for neutron cross section (XSPROC and / or ESSM) and include fission product poisoning. For the Alpha release of VERA in FY-2013 this capability will be demonstrated by successful completion of AMA Level 2 Milestone L2.AMA.P7.02 (Demonstration

of neutronics coupled to thermal-hydraulics for a full-core scenario using VERA (CASL.011)). (Ref: VRD Appendix A Section 2.1)

- Code coupling of core T-H via subchannel flows (Cobra-TF) to 2-D / 1-D core neutronics (MPACT). This capability will be demonstrated by successful completion of milestone VRI Level 3 Milestone L3:VRI.PSS.P7.03 (CTF + MPACT).

- Coupled Subchannel flow (Cobra-TF) to core neutronics (Insilico/Denovo). This capability will be demonstrated by successful completion of AMA Level 3 Milestone L3.AMA.VDT.P6.03 (Coupled Single Assembly Solution with VERA-CS).

- Coupled subchannel flow to core coolant chemistry by coupling of Cobra-TF to MAMBA. This capability will be demonstrated by successful completion of VRI Level 3 Milestone VRI.PSS.P6.03 (CTF + MAMBA)

- Coupling of core T-H to fuel performance via coupling of COBRA-TF fluid model to the selected fuel performance code (Peregrine). For the Alpha release of VERA in FY-2013 this capability will be demonstrated by successful completion of MPO / CASL Level 2 Milestone L2:MPO.P7.01 (Initial demonstration of Peregrine Integration in VERA-CS (CASL.005)).

- Three-way coupling of core neutronics, subchannel core T-H and coolant chemistry. This will include the following coupling: Subchannel flow (Cobra-TF) to core neutronics (Insilico/Denovo) to Peregrine. This capability will be demonstrated by successful completion of VRI Level 3 Milestone VRI.PSS.P7.04 (CTF + Insilico 1D/3D + Peregrine Coupling).

For the Alpha release of VERA, integrated summary documentation of the aforementioned capabilities and benchmark results will be developed to provide VERA users with an integrated overview of the state of VERA capabilities. Included in this documentation will be a set of test problems with sufficient data and results to permit the user to set-up and run these problems and verify correct results were generated for both stand-alone and coupled capabilities. Additionally, as determined by the CASL Product Applications Coordinator, applicable Test Stand applications may be upgraded to the Alpha release at this time.

2.3 VERA Documentation

This section provides a catalog of documentation that is to be provided with the VERA software. Corresponding requirements associated with these capabilities are specified in Section 6.6 of the VRD.

2.3.1 VERA Installation and User Instructions

As part of the VERA releases, a set of instructions shall be provided that describes the process for external users to install and use the VERA software on selected computational platforms. Corresponding requirements associated with these capabilities are specified in Sections 5 and 6.6 of the VRD. This documentation shall be developed by VRI and describe the following:

- Description of targeted system operating platforms and specifications. In general, as the complexity of the problems being addressed increases, the computational requirements also will increase. Examples of the computational requirements are provided (for reference) for core physics applications from experience with VERA during CASL development. The typical anticipated minimal requirements include (in terms of current generation compute "cores"):
  - Benchmark 1 (2D Hot Zero Power Pin Cell Calculations): 1 - 10 Core Machines
  - Benchmark 2 (2D Hot Zero Power Assembly Lattice): 10 - 100 Core Machines
  - Benchmarks 3 – 4 (3D Assembly and Multi-Assembly Calculations): 100 - 1000 Core Machines
  - Benchmark 5 (3D Quarter-Core Calculations): 1000+ Core Machines
  - Benchmark 6 (3D Coupled Assembly Calculations): 100+ Core Machines
  - Benchmark 7 (3D Coupled Core Calculations): 1000+ Core Machines

  (Note – see Appendix A of the VRD for specific details associated with each of the core physics benchmarks.)
- VERA installation and build instructions for identified computational platforms on which VERA is targeted to operate. Note that for the initial Test Stand and Alpha deployments, it is expected that the CASL VRI team will be available to support the VERA installation and build operations for these applications.
- Instructions for setup and execution of demonstration problems (both stand-alone and coupled applications) with solutions provided to permit end user verification of successful installation and operation.
- Instructions for applicable data input and output.
- Description of calculation abort and restart capabilities that are provided with the particular VERA deployment.
- Instructions for data pre- and post-processing for analysis and visualization of results. This will be accomplished by providing links to the third party tools provided for this purpose.

These requirements will be addressed by the following milestones:

- Test Stand Deployment: VRI Level 2 Milestone L2:VRI.P6.02 (VERA Documentation Update)
- Alpha Deployment: CASL / VRI Level 1 Milestone L1.CASL.P7.04 (VERA External Release Through RSICC (CASL.010))

2.3.2 VERA Code Structure Description

The VERA Users Manual shall provide VERA users with a description of the VERA code structure. This documentation should indicate the constituent elements that comprise the VERA software and describe the integration of the various Physics Simulation Suite (PSS) elements. For coupled applications relevant information from the particular model evaluators will be provided. The VERA documentation also shall provide a discussion of the code execution (via flowcharts and / or descriptions) for each of the different couplings between the constituent elements that are available. The expected code structures are as follows.

VERA Infrastructure

VERA User Manual. Since it is early in the set of VERA deployments, this portion of the manual is expected to be minimal in nature for these deployment and will concentrate on user installation and application to running test problems provided with VERA and verifying their solutions. However, as VERA capabilities expand with continued development this documentation will evolve over time and incorporate user feedback obtained by these (and subsequent) VERA deployments.

DAKOTA verification, validation and uncertainty quantification (V&V/UQ)

Core Physics / Neutronics Codes

Insilco/Denovo

MPACT

Thermal Hydraulic Codes

COBRA-TF

HYDRA-TH

Coolant Chemistry Code

MAMBA

Fuel Performance Code

Peregrine

Coupled Physics

For the Alpha deployment of VERA described in Section 2.2, example problems and solutions will be provided for the following code couplings:

- Subchannel flow (Cobra-TF) to 2-D / 1-D core neutronics (MPACT)
- Subchannel flow (Cobra-TF) to core neutronics (Insilico/Denovo)
- Fuel performance subchannel flow to core coolant chemistry by coupling of Cobra-TF to MAMBA
- Three-way subchannel flow (Cobra-TF) to core neutronics (Insilico/Denovo) to Peregrine

2.3.3 Documentation for VERA Components

As a minimum, CASL will supply a VERA User manual containing links to component documentation that provides the applicable theory and users manuals, and applicable verification and validation summary. This portion of the VERA User Manual should provide any necessary supplementary information for the coupled use of the codes, combined input formats, and other guidance unique to the use of the codes in a coupled manner and/or within the VERA environment.

For the purposes of the deployments covered in this release plan, the minimum expectations for these write-ups include a summary of the applicable theory, code usage (including setup, running, inputs), and example problems and reference solutions. In general the documentation for existing codes (e.g. Cobra-TF, Hydra, etc.) is considered sufficient for the purpose. For codes that currently are under development (e.g. Peregrine, MAMBA, etc.), documentation for standalone operation of the codes must provide the basic summary description of the relevant information. Since these write-ups are anticipated to be developed from scratch, the expectation is that they will contain sufficient information that would permit use of the code by personnel familiar with similar existing industry legacy codes (but who are external to CASL) who could be involved with use of Test Stand or Alpha versions of VERA.

2.4 CASL Quality Assurance

Quality Assurance requirements applicable to the VERA software that will be deployed in the Test Stand and Alpha deployments shall be developed and tested in accordance with the approved CASL Quality Assurance Plan.

2.5 Technology Transfer

For the deployment of VERA to CASL Test Stands and for the Alpha release, this section describes provisions for user support. For the Test Stand and Alpha version deployments the following will be available to identified users.

- Capabilities for the user to install VERA and demonstrate how to setup and run the suite of example problems that are provided.
- CASL point-of-contact and e-mail support to catalog, prioritize and resolve VERA problems identified by users.

Note – for later public releases of VERA (i.e. those that occur starting in FY-2014), it is anticipated that a suite of training courses and user support structure will be developed (that will be made available for a fee).

3. VERA RELEASE REVIEW AND APPROVALS

This section provides for reviews and approvals to ensure that the constituent elements that are contained within VERA meet the technical requirements described in Section 2. In addition, to specific capabilities and documentation associated with each deployment, the following actions shall be taken by the referenced CASL personnel to review and approve each deployment of VERA covered in this release plan.

> The Test Stand deployment of VERA shall be approved by the VRI FA Lead, with notification to CASL Director and SLT. (VRD Section 6.4.5)
>
> The Alpha deployment of VERA shall be approved by the CASL Director. (VRD Section 6.4.4)

It is important to note that this document only addresses the technical readiness of the codes for release. It is well known that there are significant background intellectual property (BIP) and licensing issues that must be resolved to allow release of the Alpha VERA code through RSICC or other mechanisms. The BIP and licensing issues will need to be addressed in a separate line of action to produce a successful VERA release. In addition, both the Test Stand and Alpha deployments of the VERA software shall comply with established export control requirements. (VRD Section 6.4.3) These requirements also need to be addressed in a separate line of action. It is noted here that the activities addressing these issues are being addressed within the CASL IP Management Plan and are the responsibility of the CASL SLT to bring to closure. However, for completeness, the deployment action matricies contained in this section include specific signoffs for applicable CASL staff to verify that the relevant IP and EC actions necessary for each specific deployment have been completed.

3.1 Test Stand Release Plan Actions and Approvals

VERA Release Plan – Test Stand Deployment Action Matrix

Activity	Action (with Applicable Milestone)	TRAC ID	Owner	Status	Due Date
VERA Technical Capabilities					
Test Stand Component Selection	Complete Milestone L3.VRI.P7.01 (VERA 3.0 Snapshot)	817	Ross Bartlett		2013-05-01
Integration of MPACT and Insilico / Denovo into VERA 3.0 Snapshot	Complete Milestone L2.VRI.P6.04 (VERA 3.0 Snapshot)	755	John Turner	Action Complete in TRAC 2013-03-29	2013-03-29
PWR HZP BOL Core via 2-D/1-D via MPACT	Complete Milestone L2.RTM.P6.01 (Application of 2D/1D MOC to AMA Core Simulator Progression Problem 5)	794	Ben Collins		2013-03-28
	Successfully apply MPACT to AMA Benchmark Problem No.5 for Quarter Core and Compare Results (TBD) with TBD.	794	Andrew Godfrey		2013-XX-XX
Virtual Reactor Demonstration with VERA-CS At BOC, HZP Conditions	Complete AMA L2 Milestone L2.AMA.P7.01 (Virtual Reactor Demonstration with VERA-CS At BOC HZP Conditions)	730	Andrew Godfrey		2013-05-07
	Develop quarter core references for Core Simulator Progression Problem 5 (Milestone L3.AMA.APP.P6.04)	746	Andrew Godfrey	Action Complete in TRAC 2013-03-29	2013-03-29
	Obtain final TVA data for WBN1 ZPPT (Milestone L3.AMA.APP.P6.02)	724	Rose Montgomery	Action Complete in TRAC 2013-03-29	2013-03-29
	Obtain ZPPT predictions from VERA-CS	730	Andrew Godfrey		2013-04-28
	Complete problem / results documentation	730	Andrew Godfrey		2013-04-22
	Complete problem / solution review	730	Jess Gehin		2013-05-07
Operational Reactor Model Demonstration with VERA-CS	Complete CASL L1 Milestone L1.CASL.P7.01 (Operational Reactor Model Demonstration with VERA-CS (CASL.003))	98	Jess Gehin		2013-06-07
2-D PWR Lattice Physics Calculations via MPACT MOC	Complete AMA L3 Milestone L3.AMA.VDT.P6.01 (Analysis of Two-Dimensional Lattice Physics Verification Problems with MPACT)	721	Andrew Godfrey	Action Complete in TRAC 2013-03-29	2013-02-05
Subchannel T-H (COBRA-TF) to core neutronics (Insilico / Denovo)	Complete Milestone L3.AMA.VDT.P6.03 (Coupled Single Assembly Solution with VERA-CS)	727	Andrew Godfrey	Per Baseline Change #2 (2013-03-28), this milestone is being delayed until 2013-07-31. Thus this capability will NOT be provide in the Test Stand deployment.	2013-04-30
Integration of COBRA-TF Subchannel capability into VERA 3.0 Snapshot	Complete Milestone L2.VRI.P6.04 (VERA 3.0 Snapshot)	755	John Turner	Action Complete in TRAC 2013-03-29	2013-03-29
Integration of HYDRA CFD capability into VERA 3.0 Snapshot	Complete Milestone L2.VRI.P6.04 (VERA 3.0 Snapshot)	755	John Turner	Action Complete in TRAC 2013-03-29	2013-03-29
Integration of Peregrine into VERA 3.0 Snapshot	Complete Milestone L2.VRI.P6.04 (VERA 3.0 Snapshot)	755	John Turner	Action Complete in TRAC 2013-03-29	2013-03-29
Integration of MAMBA into VERA 3.0 Snapshot	Complete Milestone L2.VRI.P6.04 (VERA 3.0 Snapshot)	755	John Turner	Action Complete in TRAC 2013-03-29	2013-03-29
Technical Documentation					
	Provide VERA installation and build instructions for identified computational platforms on which VERA is targeted to operate. (No				

	Milestone in TRAC)				
	Provide instructions for setup and execution of demonstration problems. (No Milestone in TRAC)				
	Provide instructions for data input /output and description of calculation abort / restart capabilities. (No Milestone in TRAC)				
User Support					
	CASL Point-of-Contact Identified (No Milestone in TRAC)				
	Establish CASL e-mail Protocols and Support (No Milestone in TRAC)				

VERA Release Plan – Test Stand Deployment Approvals

(1) VERA technical capabilities are sufficient to support the identified Test Stand application.

Rose Montgomery (CASL Product Applications Coordinator) _____/_____

(2) VERA documentation is sufficient to support the identified Test Stand application.

Rose Montgomery (CASL Product Applications Coordinator) _____/_____

(3) VERA quality assurance is sufficient to support the identified Test Stand application.

Matt Sieger (CASL Quality Manager) _____/_____

(4) VERA IP issues have been resolved such that the code can be released to the Test Stand host and used for to support the identified Test Stand application.

Jeff Cornet (CASL IP Manager) _____/_____

(5) VERA EC issues have been resolved and sufficient controls are in place such that the code can be released to the Test Stand host and used for to support the identified Test Stand application.

Jeff Cornet (CASL IP Manager) _____/_____

(6) VERA operational functionality is verified acceptable and the code can be released to the Test Stand host and used for to support the identified Test Stand application. CASL Senior Leadership Team has been notified that VERA is ready for Test Stand deployment.

John Turner (CASL VRI Focus Area Lead) _____/_____

VERA Release Plan – Test Stand Deployment Approvals

Approval for release of VERA to Test Stand host for use in the identified Test Stand application.

Paul Turinski (CASL Chief Scientist) _____/_____

Douglas Burns (CASL Deputy Director) _____/_____

Douglas Kothe (CASL Director) _____/_____

3.2 Alpha Release Plan Actions and Approvals

VERA Release Plan – Alpha Deployment Action Matrix

The following provide descritoins of the prioritizaitons provide in the following Action Matrix:

High = Considered to be a capability that is essential for planned near term[c] exercise of VERA. ("Must Have");

Med = Considered to be a capability that is highly desired for planned near term exercise of VERA. ("Want to Have");

Low = Considered to be a capability that is ancillary in that it is not planned for use in near term exercise of VERA. ("Nice to Have").

Activity	Action (with Applicable Milestone)	TRAC ID	Owner	Status	Due Date	Priority
VERA Technical Capabilities						
VERA Alpha Release	Complete Milestone L1:CASL.P7.01 (VERA External Release thru RSICC (CASL.010))	99	John Turner		2013-09-28	High
	Complete Milestone L3:VRI.P7.04 (Component Selection for Release)	823	Roscoe Bartlett		2013-08-28	High
PWR HFP BOL Assembly via Insilico / Denovo	Complete AMA Level 3 Milestone L3.AMA.VDT.P6.03 (Coupled Single Assembly Solution with VERA-CS)	727	Andrew Godfrey	Per Baseline Change #2 (2013-03-28), this milestone is being delayed until 2013-07-31. Thus this capability will NOT be provide in the Test Stand deployment.	2013-04-30	Med
Subchannel T-H (COBRA-TF) to 2-D / 1-D core neutronics (MPACT)	Complete Milestone L3:VRI.PSS.P7.03 (CTF + MPACT)	819	Ben Collins		2013-06-19	High
	Complete Milestone L2:AMA.P7.02 (Demonstration of neutronics coupled to thermal-hydraulics for a full-core scenario using VERA (CASL.011))	731	Andrew Godfrey		2013-09-30	High
	Demonstrate zero power full core capability with MPACT	731	Andrew Godfrey		2013-05-07	High
	Demonstrate single assembly with T/H coupled feedback with MPACT (repeat Problem 6 analysis)	731	Andrew Godfrey		2013-06-30	High
	Capabilities ready for transient xenon / samarium and critical boron searches	731	Andrew Godfrey		2013-07-31	High
	Perform analyses	731	Andrew Godfrey		2013-08-30	High
	Complete documentation	731	Andrew Godfrey		2012-09-16	High
Subchannel T-H (COBRA-TF) to core neutronics (Insilico / Denovo)	Complete Milestone L3.AMA.VDT.P6.03 (Coupled Single Assembly Solution with VERA-CS)	727	Andrew Godfrey	Per Baseline Change #2 (2013-03-28), this milestone is being delayed until 2013-07-	2013-04-30	Med

[c] For purposes of this document, near term is defined as a 3-month time span.

				31. Thus this capability will NOT be provide in the Test Stand deployment.		
Subchannel T-H (COBRA-TF) to coolant chemistry (MAMBA)	Complete MilestoneL3: VRI.PSS.P6.03 (CTF + MAMBA)	754	Ramanan Sankaran	Action Complete in TRAC 2013-03-19	2013-03-15	Complete
	Complete Milestone L3:VRI.PSS.P6.03 (Improved CTF + MAMBA)	815	Ramanan Sankaran		2013-05-01	Med
Subchannel T-H (COBRA-TF) to fuel performance (Peregrine)	Complete Milestone L2:MPO.P7.01 (Initial demonstration of Peregrine Integration in VERA-CS (CASL.005))	665	Chris Stanek		2013-01-31	Low
Subchannel flow (Cobra-TF) to core neutronics (Insilico / Denovo) to fuel performance Peregrine	Complete Milestone L3:VRI.PSS.P7.04 (CTF + Insilico 1D/3D + Peregrine Coupling)	834	Scott Palmtag		2013-07-24	Low
Technical Documentation						
	Complete Milestone L2: VRI.P6.02 (VERA Documentation Update)	752	John Turner	Note – as of 4/1/2013 milestone is 55% complete.	2013-01-30	Low
	Design documentation	752	John Turner			Med
	Integration process	752	John Turner			Low
	Deployment strategy	752	John Turner			Low
	Input / output / restart strategy	752	John Turner			High
	V&V strategy	752	John Turner			Low
	Provide VERA Users Manual with links to associated component code manuals / documentation. (No Milestone in TRAC)					Med
	Provide VERA installation and build instructions for identified computational platforms on which VERA is targeted to operate. (No Milestone in TRAC)					High
	Provide instructions for setup and execution of demonstration problems. (No Milestone in TRAC)					High
	Provide instructions for data input /output and description of calculation abort / restart capabilities. (No Milestone in TRAC)					High
	Provide instructions for data pre- and post-processing for analysis / visualization of results. (No Milestone in TRAC)					Med
	Provide descriptions of coupled codes provided in release. (No Milestone in TRAC)					Med
	Provide example problems and solutions code couplings provided in release. (No Milestone in TRAC)					Med
User Support						
	CASL Point-of-Contact Identified (No Milestone in TRAC)					High
	Establish CASL e-mail Protocols and Support (No Milestone in TRAC)					High

VERA Release Plan – Alpha Deployment Approvals

(1) VERA technical capabilities are sufficient to support the Alpha deployment.

Rose Montgomery (CASL Product Applications Coordinator) _____/_____

(2) VERA documentation is sufficient to support the Alpha deployment.

Rose Montgomery (CASL Product Applications Coordinator) _____/_____

(3) VERA quality assurance is sufficient to support the Alpha deployment.

Matt Sieger (CASL Quality Manager) _____/_____

(4) VERA IP issues have been resolved such that the code can be released for the Alpha deployment.

Jeff Cornet (CASL IP Manager) _____/_____

(5) VERA EC issues have been resolved an dsufficient controls are in place such that the code can be released for the Alpha deployment.

Jeff Cornet (CASL IP Manager) _____/_____

(6) VERA operational functionality is verified acceptable and the code can be released for the Alpha deployment. CASL Senior Leadership Team has been notified that VERA is ready for Test Stand deployment.

John Turner (CASL VRI Focus Area Lead) _____/_____

VERA Release Plan – Alpha Deployment Release Approvals

Approval for release of VERA for the Alpha deployment.

Paul Turinski (CASL Chief Scientist) _____/_____

Douglas Burns (CASL Deputy Director) _____/_____

Douglas Kothe (CASL Director) _____/_____

4. REFERENCES

[1] VERA Requirements Document (VRD)

APPENDIX A

Test Stand Release and Deployment Action List and Owners

	Action	**Owner**
1.	A Test Stand host prepares a proposal and submits it to CASL	TS
2.	CASL reviews Test Stand proposal and determines if it is acceptable (based on selection guidelines) and CASL software capabilities	PAC
3.	Review Test Stand proposal and identify additional capabilities that are needed (outside of those already supported or part of the CASL planned development activities, which should already have established milestones) to support the Test Stand work	PAC
4.	Define activities and milestones (including resource estimates) that must be completed to provide the additional capabilities identified in item 3.	PAC/FA Leads
5.	Review resources to perform work identified in item 4 and confirm that resources are available. If not, determine if the Test Stand needs to be delayed or rescoped	PAC/SLT
6.	Determine computing requirements and if the work will be performed on OLCF computing resources. If so, initiate coordination with OLCF for allocation/accounts	PAC
7.	Create TRAC ticket for release and ensure that all blocking milestones are included.	PAC/FA Leads
8.	Initiate work on milestones as appropriate	FA Leads
9.	Work with VRI to determine installation approach (e.g. delivery of installation package, CASL installation on Test Stand host machine). Create milestone to support.	PAC/VRI FA Lead
10.	Perform review of planned release software to determine and resolve IP, Licensing, or proprietary information issues	PAC/ CASL IP-Licensing
11.	Determine support point of contact and effort requirements.	PAC
12.	Monitor progress of all milestones that support the Test Stand and update overall Test Stand release schedule based on progress	PAC
13.	Develop or update documentation (such as user manuals, installation instructions, test problems, etc.)	VRI FA Lead

14.	Perform testing of software	FA Leads
15.	Confirm milestone completions meet requirements for release, that testing indicates that the software is expected to support Test Stand activities, and all IP/Licensing issues have been resolved for release. Document in completion memo to SLT	PAC
16.	SLT approval for release of software to Test Stand	SLT
17.	Hold kick off meeting with Test Stand to communicate details of installation, software capabilities and limitations, and to review completion schedule and expected results for Test Stand	PAC
18.	Provide installation package or perform installation on Test Stand computer or OLCF computer	VRI FA Lead
19.	Monitor progress of Test Stand activities and provide support as needed or requested	PAC/FA Leads
20.	Upon completion of Test Stand review deliverable report and data received to ensure that it is complete.	PAC
21.	Hold close-out meeting with Test Stand host to review results and determine any lessons learned or other action items	PAC/TS
22.	Prepare a Test Stand completion memo including as summary of the Test Stand results, lessons learned, action items	PAC

PAC = Product Applications Coordinator
SLT = Senior Leadership Team
FA Leads = Focus Area Leads
TS = Test Stand
VRI = Virtual Reactor Integration